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(54) **METHOD FOR REDUCING EMISSIONS  
FROM EVAPORATIVE EMISSIONS  
CONTROL SYSTEMS**

(75) **Inventors:** **Laurence H. Hiltzik**, Charleston, SC  
(US); **Jacek Z. Jagiello**, Charleston, SC  
(US); **Edward D. Tolles**, Charleston,  
SC (US); **Roger S. Williams**,  
Lexington, VA (US)

(73) **Assignee:** **MeadWestvaco Corporation**,  
Stamford, CT (US)

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**References Cited**

**U.S. PATENT DOCUMENTS**

4,677,086 A \* 6/1987 McCue et al. .... 123/519  
4,894,072 A \* 1/1990 Turner et al. .... 123/519  
5,204,310 A \* 4/1993 Tolles et al. .... 123/519  
5,206,207 A \* 4/1993 Tolles ..... 502/423  
5,207,808 A \* 5/1993 Haruta et al. .... 123/519  
5,238,470 A \* 8/1993 Tolles et al. .... 95/143  
5,250,491 A \* 10/1993 Yan ..... 264/117  
5,276,000 A \* 1/1994 Matthews et al. .... 502/424  
5,304,527 A \* 4/1994 Dimitri ..... 502/416  
5,324,703 A \* 6/1994 McCue et al. .... 502/424  
5,337,721 A \* 8/1994 Kasuya et al. .... 123/519

5,408,976 A \* 4/1995 Reddy ..... 123/198 D  
5,416,056 A \* 5/1995 Baker ..... 502/425  
5,456,236 A \* 10/1995 Wakashiro et al. .... 123/519

(List continued on next page.)

**FOREIGN PATENT DOCUMENTS**

EP 11 13163 7/2001  
KR 2002012826 A \* 2/2002  
WO 92/01585 9/1992  
WO 01/62367 8/2001

**Primary Examiner**—David A. Simmons  
**Assistant Examiner**—Frank M. Lawrence

(74) **Attorney, Agent, or Firm**—Terry B. McDaniel; Daniel  
B. Reece, IV; Thomas A. Boshinski

**ABSTRACT**

(57)  
Disclosed is a method for sharply reducing diurnal breathing loss emissions from automotive evaporative emissions control systems by providing multiple layers, or stages, of adsorbents. On the fuel source-side of an emissions control system canister, high working capacity carbons are preferred in a first canister (adsorb) region. In subsequent canister region(s) on the vent-side, the preferred adsorbent should exhibit a flat or flattened adsorption isotherm on a volumetric basis and relatively lower capacity for high concentration vapors as compared with the fuel source-side adsorbent. Multiple approaches are described for attaining the preferred properties for the vent-side canister region. One approach is to use a filler and/or voidages as a volumetric diluent for flattening an adsorption isotherm. Another approach is to employ an adsorbent with the desired adsorption isotherm properties and to process it into an appropriate shape or form without necessarily requiring any special provision for dilution. The improved combination of high working capacity carbons on the fuel source-side and preferred lower working capacity adsorbent on the vent-side provides substantially lower diurnal breathing emissions without a significant loss in working capacity or increase in flow restriction compared with known adsorbents used in canister configurations for automotive emissions control systems.

**30 Claims, 3 Drawing Sheets**

